The effect of worrying on intolerance of uncertainty and positive and negative beliefs about worry

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The Effect of Worrying on Intolerance of Uncertainty and Positive and Negative Beliefs about Worry

Abstract

Background and Objectives: The effect of a worry manipulation on the clinical constructs intolerance of uncertainty (IU), negative beliefs about the consequences of worry (NCOW), positive beliefs about the consequences of worry (PCOW), in addition to the emotions anxiety and sadness, was examined.

Methods: A non-clinical sample was split into two groups, a worry group (n = 29), who were asked to generate 20 potential worries about a hypothetical scenario, and a control group (n = 28), who were asked to generate 2 potential worries about the same scenario. Subsequently, participants were asked to complete measures of IU, NCOW, PCOW, sadness and anxiety.

Results: The worry group scored significantly higher than the control group on measures of IU, NCOW and PCOW but not on measures of sadness and anxiety.

Limitations: Possible limitations of the current study include the use of a student sample and the use of a hypothetical worry scenario.

Conclusions: The results suggest that engaging in worry can increase scores on measures of the beliefs and thought patterns often used to causally explain worry. The results are in line with recent research showing bidirectionality between anxiety related symptoms and their

associated clinical constructs, and are consistent with an approach which sees anxiety symptoms as part of an evolved integrated threat management system that alerts the individual to threats to goals or challenges, and coordinates cognitive, behavioral, and affective reactions to enable effective responding to these threats and challenges.

Keywords: Worry; Generalised Anxiety Disorder; Metacognitive Beliefs; Intolerance of Uncertainty; Negative Mood.

1. Introduction

Worry has been defined as a "chain of thoughts and images, negatively affect laden and relatively uncontrollable" (Borkovec, Robinson, Pruzinsky, & DePree, 1983, p. 10). Excessive and uncontrollable worry is the central feature of Generalised Anxiety Disorder (GAD; American Psychiatric Association, 2013) which affects around 2% of the population at any one time (Holaway, Rodebaugh, & Heimburg, 2006). More broadly, approximately two thirds of the population report one or more worries, with those who engage in worry reporting an average of 3 worry topics (Goncalves & Byrne, 2013), and taxometric studies suggest that normal and pathological worry are best conceptualised as occupying two points on a single continuum (e.g., Ruscio, Borkovec, & Ruscio, 2001). "Interpersonal" worries are the most frequently reported worry topic and there is a moderate positive relationship between the reported number of worries and psychological distress (Goncalves & Byrne, 2013).

Over approximately the past 20 years, cognitive models of perseverative worry have attempted to develop constructs which capture the beliefs and thought patterns associated with worry. Two of the most conspicuous of these models are the intolerance of uncertainty (IU) model (Dugas, Freeston, & Ladouceur, 1997; Dugas, Buhr, & Ladouceur, 2004) and the metacognitive model (Wells, 1999). The aim of the present study was to examine if the process of worrying facilitates scores on prominent constructs found within these two models, constructs which are generally described within the literature as having a causal effect on worry.

IU is defined as a "dispositional characteristic that arises from a set of negative beliefs about uncertainty and its connotations and consequences" (Birrell, Meares,

Wilkinson, & Freeston, 2011, p.1200) and is underpinned by appraisals such as 'uncertainty is dangerous', 'uncertainty is intolerable' and 'I can't deal with uncertainty' (Koerner & Dugas, 2006). The IU model (Dugas et al., 1997; Dugas et al., 2004) proposes that individuals high in IU find uncertain or ambiguous situations extremely distressing, and that this will trigger a 'what if…?' thinking style. The model also proposes that IU leads to a negative problem orientation and heightens cognitive avoidance, whereby worry functions as an affective dampening strategy driven by a difficulty in tolerating negative emotional states, both of which help to preserve worry. IU is therefore important in both creating a worry bout and maintaining it (Koerner & Dugas, 2006).

The metacognitive model (Wells, 1999) draws a distinction between worries (type 1 worry) and appraisals of worrying (type 2 worry). Additionally, the model also distinguishes between positive beliefs about the consequences of worry (PCOW, e.g., worrying clarifies my thoughts and concentration) and negative beliefs about the consequences of worry (NCOW, e.g., worrying makes me tense and irritable). Type 1 worry is triggered in response to anxiety provoking stimuli and this type of worry is linked to PCOW, such as believing that worrying will help the individual solve the problem. Type 2 worry occurs as a consequence of type 1 worry and is linked to NCOW, such as believing that worrying too much will make the individual ill. NCOW may trigger a number of mechanisms designed to gain control of a worry, such as thought suppression and avoidance, which paradoxically have the opposite effect (by, for example, increasing the salience of internal events). PCOW and NCOW, therefore, both have the potential to drive and maintain a worry bout.

A number of studies have demonstrated that IU correlates with trait worry (e.g., Buhr & Dugas, 2006) as do both NCOW and PCOW (e.g., Cartwright-Hatton & Wells, 1997). Thielsch, Andor, and Ehring (2015), using Ecological Momentary Assessment in which worry

was assessed 7 times a day over a one week period, found that both IU and NCOW were significantly associated with worry, but that PCOW was not. IU has also been shown experimentally to have a causal effect on worry. Meeten, Dash, Scarlet, and Davey (2012) manipulated IU by having non-clinical participants imagine they were a character either high or low in IU when describing an event which had caused them uncertainty in their own lives. They found that the high IU group spent significantly longer engaging in a subsequent worry task than the low IU group. Prados (2011) induced positive beliefs about worry and negative beliefs about worry in separate groups. This was achieved using recorded messages intended to persuade participants that worry either has positive consequences or that worry has negative consequences. Prados (2011) found that neither the PCOW group or NCOW group differed from a control group in terms of subsequent worry.

In contrast to the studies described above which investigate the relationship between constructs and worry or the effects of construct-relevant manipulations on worry, we here describe the results of a study designed to investigate the effects of worrying on measures of IU, NCOW and PCOW in a non-clinical population. The current study manipulated the degree to which participants were asked to engage in a worry task and examined the effect of this on measures of IU, NCOW and PCOW. There are several examples in the anxiety literature of bidirectionality between symptoms and their associated emotions, beliefs and thought patterns. For example, Davey, Meeten, Barnes, and Dash (2013) found that experimentally increasing aversive intrusive thoughts raised scores on inflated responsibility, IU and thought-action fusion, suggesting that symptoms can have a direct causal impact on measures of the constructs that are often used to explain them. Similarly, experimentally manipulating negative mood increases scores on measures

of IU and inflated responsibility, whilst manipulating IU or inflated responsibility increases negative mood (Britton & Davey, 2014). With respect to worry - anxiety, fear and negative mood increase the tendency to worry (Buhr & Dugas, 2009; Johnston & Davey, 1997) but experimentally inducing worry also raises scores on measures of anxiety (McLaughlin, Borkovec, & Sibrava, 2007).

The IU model (Dugas et al., 1997; Dugas et al., 2004) and the metacognitive model (Wells, 1999) provide explanations as to how IU, NCOW and PCOW, respectively, might act as both initiating and maintenance factors in worry, with varying degrees of empirical support in relation to each construct. There is some evidence to suggest that engaging in worry might increase scores on some of the constructs measured in the current study. In relation to IU, a longitudinal study in adolescents found a bidirectional and reciprocal relationship between IU and worrying, with each explaining unique variance in the development of the other across a five year period (Dugas, Laugesen, & Bukowski, 2012). In relation to beliefs about worry, Cartwright-Hatton and Wells (1997) suggest that the experience of repeatedly worrying may lead to a diminished sense of control over time and that this may automatically initiate negative beliefs about worry.

To the authors' knowledge the current study is the first to examine whether worrying influences constructs which are usually used to explain worry. The study has the potential to inform both the IU model and the metacognitive model by, for example, providing the first empirical examination of whether worrying facilitates scores on measures of NCOW, as hypothesised by Cartwright-Hatton and Wells (1997). More broadly, the study explores whether recent findings within the anxiety literature which demonstrate

bidirectionality between symptoms and the constructs which are usually used to causally explain those symptoms, potentially extends to worry and worry related constructs.

In addition to the constructs discussed above negative mood was also measured in order to potentially examine the role of negative affect as a potential mediator in any relationships found between the worry and the constructs previously discussed. Evidence suggests that negative mood has a bidirectional relationship with both worry (Buhr & Dugas, 2009; Johnston & Davey, 1997; McLaughlin et al., 2007) and IU (Britton & Davey, 2014) and negative mood is associated with both PCOW and NCOW (Cartwright-Hatton & Wells, 1997).

2. Method

2.1 Participants

All participants were volunteers who were recruited via online social media and via the University of Derby research participation scheme. This research participation scheme is open to psychology undergraduates at the University of Derby and provides undergraduates with research participation credit which can be used towards partial fulfilment of a course requirement. There were a total of 57 participants (female = 46, male = 11). Ages ranged from 18 to 68 (*M* = 35.21, SD = 13.87).

Ethical approval for the current study was obtained from University of Derby. All procedures were performed in accordance with the ethical standards of the British Psychological Society and with the 1964 Helsinki declaration and its later amendments.

2.2 Measures

2.2.1 Pre-manipulation Measures

Pre-manipulation worry levels were measured using the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990), a 16-item questionnaire developed to assess the frequency and intensity of worry. The internal consistency of the PSWQ in the current sample was excellent (α = .93).

2.2.2 Visual Analogue Scale (VAS) measures

Because validated measures of IU, NCOW and PCOW may not be sensitive enough to register changes resulting from proximal experimental manipulations, a smaller selection of items were selected from the Intolerance of Uncertainty Scale – Short Form (IUS-12; Carleton, Norton, & Asmundson, 2007) and the Consequences of Worry Scale (COWS; Davey, Tallis, & Capuzzo, 1996) to measure IU, NCOW and PCOW respectively. Each item was converted into a 100-point VAS scale where participants were asked to rate the extent with which they agreed at that moment in time with each statement (where 0 = Do not agree and 100 = Very much agree). Each item related to IU, NCOW and PCOW, respectively, were then summed to create a composite VAS score for each construct. The reason for using VAS measures of the relevant constructs, in addition to the full measures, is threefold. Firstly, studies have suggested that VAS scales are both more sensitive and reliable in detecting small and immediate changes in status in comparison to Likert scales (e.g., Grant et al., 1999; Reips & Funke, 2008). All of the full measures used in the current study incorporate Likert scales. Secondly, the use of a smaller selection of items means that participants are asked to produce a score on each construct in a relatively short period of time in comparison to if they had been asked to immediately complete each full construct measure after the worry manipulation. Such an approach is consistent with other studies which aim to measure the effect of experimental manipulations on clinical constructs (e.g.,

Britton & Davey, 2014) and it is hoped the reduced time required to collect scores on each construct will result in the VAS measures being more sensitive in detecting any immediate effect of the worry manipulation on these constructs (Britton & Davey, 2014). Finally, the VAS measure questions were worded to ask the participant to respond in relation to how they feel at that moment in time as opposed to the full construct measures which ask participants to provide answers in relation to how they feel more generally. These VAS measures were administered directly after the experimental manipulation. Full scale measures were administered immediately after the VAS measures. The validity of the VAS measures was assessed by analysing correlations between the composite VAS score and the score on the respective full measure.

IU was measured using 4 items selected from the IUS-12 (Carleton et al., 2007). Carleton et al. (2007) suggest that two factors underlie the IUS -12: prospective anxiety and inhibitory anxiety. Two of the items chosen to measure IU in the current study were those items which loaded most highly onto the prospective anxiety subscale in Carleton et al. (2007), and the third and fourth items are those which loaded most highly onto the inhibitory anxiety subscale in the same paper. These items were, “Unforeseen events upset me greatly”, “I can’t stand being taken by surprise”, “When I am uncertain I can’t function very well” and “When it’s time to act, uncertainty paralyses me”. The internal consistency of these 4 items in the current sample was good ($\alpha = .82$).

NCOW was measured using 3 items from the COWS (Davey et al., 1996). Davey et al. (1996) suggest that three factors underlie NCOW: worry disrupts effective performance, worry exaggerates the problem and worrying causes emotional discomfort. The three items chosen to measure NCOW were the three items which loaded most highly onto these 3

factors respectively in Davey et al. (1996). These items were, “Worrying increases my anxiety and so decreases my performance”, “I become paranoid when I worry” and “Worry causes me stress”. The internal consistency of these 3 items in the current sample was acceptable (α = .74).

PCOW was measured using 2 items from the COWS (Davey et al., 1996). Davey et al. (1996) suggest that two factors underlie PCOW: worry motivates and worry helps analytic thinking. The two items chosen to measure PCOW were the two items which loaded most highly onto these 2 factors respectively in Davey et al. (1996). These items were, “Worrying challenges and motivates me, without them I would not achieve much in life” and “Worrying makes me reflect on life by asking questions I might not usually ask when happy”. The internal consistency of these 2 items in the current sample was mediocre (α = .63).

In addition to the above, negative mood was measured using two items with VAS scales. Participants were asked to rate their current level of sadness and anxiety on separate 100 point VAS scales (where 0 = *not at all sad/anxious* and 100 = *extremely sad/anxious*).

2.2.3 Full scale measures

IU was measured using the IUS-12 (Carleton et al., 2007). The internal consistency of the IUS-12 in the current sample was excellent (α = .94). NCOW were measured using the COWS (Davey et al., 1996). The internal consistency of the NCOW subscale in the current sample was excellent (α = .97). PCOW were also measured using the COWS (Davey et al., 1996). The internal consistency of the PCOW subscale in the current sample was excellent (α = .95).

2.3 Procedure

Once participants had indicated they wished to take part in the study they were emailed a link which led to an information sheet and subsequently to the informed consent form. The experimental manipulation and all measures were administered via the online data collection tool Qualtrics.

Stage 1: *Informed consent and questionnaire completion.* Participants were given an information sheet briefly outlining the experimental procedure. In this information sheet participants were asked to remain at their computer or other device throughout the duration of the study and were informed the study would take approximately 25-40 minutes to complete. Participants were also asked to ensure they completed the study at a time and location where they would not be distracted. Participants then completed an informed consent form and provided some basic demographic details before completing the PSWQ.

Stage 2: *Worry manipulation.* Participants were randomly assigned to a worry group (n = 29, male n = 5) or a control group (n = 28, male n = 6) at this stage by the random assignment feature in Qualtrics. Participants in both groups were presented with the following scenario and were asked to imagine that they were the person in the scenario and that the situation had just happened to them:

It's a Monday morning and you are on your way to work. When walking to the bus stop you pick up a newspaper at the newsagents to read on your bus journey to work. You take out your wallet/purse and pay for your newspaper before walking to the bus stop. As the bus arrives you get out the correct change for your bus ticket from your pocket, having counted this out before you left the house to avoid having to get out your wallet/purse at the bus stop. You know you have a particularly big day ahead of you at work and so when you get off the bus you decide to buy yourself a fresh coffee in the coffee shop which the bus

stops directly in front of. You order your coffee and upon paying you realise that you no longer have your wallet/purse. You retrace your steps of that morning in your head in an attempt to understand what might have happened. You know that you took your wallet/purse with you when you left your house as you paid for your newspaper. However, it is clear that somewhere between paying for your newspaper and ordering your coffee you lost possession of your wallet/purse.

After reading the scenario participants were asked to provide reasons (or 'worry incidents') regarding why this situation would worry them (e.g., one possible example of a worry incident would be "I worry that my mother would be upset with me as she bought me the wallet/purse for my birthday"). Participants were asked to write each worry incident in short sentence format in spaces provided. Participants in the control group were asked to provide only two worry incidents before moving onto stage 3 of the experiment. Participants in the worry group, in contrast, were asked to provide twenty worry incidents before moving onto stage 3. Qualtrics was set up so that participants in both groups could only move onto stage 3 of the experiment once they had provided the requested number of worry incidents.

Stage 3: *VAS measures.* All participants completed the VAS measures of IU, NCOW, PCOW and negative mood outlined in the measures section.

Stage 4: *Full scale measures*. All participants completed the IUS-12 and COWS.

Stage 5: *Debrief.* Participants were presented with the debriefing sheet and thanked for their participation.

3. Results

Comparisons between groups were made using independent samples t-tests where parametric test assumptions were met. Where parametric test assumptions were not met, comparisons between groups were made using the Mann–Whitney *U* test. In order for an effect on one of the dependent constructs to be considered significant two criteria must be reached. Firstly, the VAS measure of the construct must significantly positively correlate with the full measure of that construct. For correlations, Pearson's *r* is reported unless parametric assumptions were not met, in which case Spearman's r_s is reported. Secondly, the difference between the two groups on the VAS measure of that construct must reach the level of $p < .05$ (two-tailed). Note that the first of these criteria were not applied to baseline worry levels and to negative mood which were measured at only one time point.

Unless otherwise stated, all means reported refer to the mean score at item level within the relevant composite measure, sub-scale measure or full questionnaire measure being reported.

3.1 Pre-manipulation worry levels

Prior to the experimental manipulation, the worry group and control group did not differ significantly in terms of PSWQ score. This suggests that the two groups did not differ significantly in terms of their worry levels prior to the manipulation.

Females ($M = 3.57$, SD = .82) scored significantly higher on the PSWQ than males ($M = 2.88$, SD = .78), $t(55) = 2.52$, $p < .05$, $d = 0.86$, a finding consistent with other studies utilising undergraduate samples (e.g., Meyer et al., 1990). Age and PSWQ total score were negatively correlated but this correlation was not significant, $r(57) = -.15$, $p = .28$. The mean total score (that is the total score on the full PSWQ) for the whole sample in the current

study (M = 54.97, SD = 13.61) is slightly higher but comparable to that reported by Meyer et al. (1990) in the studies in which they utilised undergraduate samples (study 2: M = 48.80, SD = 13.80; study 4: M = 46.70, SD = 14.01).

3.2 Negative mood

The control group and worry group did not differ significantly in terms of sadness or anxiety scores. As the groups did not differ significantly in terms of negative mood, neither sadness or anxiety were explored as potential mediators in any of the analyses which follow.

3.3 IU

A composite IU score was created by combining the means of the four VAS IU questions. The composite IU score was significantly correlated with the score on the IUS-12, $r(57) = .82$, $p < .001$, suggesting that the VAS measure possessed convergent validity with the full measure. The worry group (M = 57.30, SD = 24.80) scored significantly higher on the composite IU measure than the control group (M = 43.72, SD = 19.22), $t(55) = 2.31$, $p < .05$, d = 0.62. On the IUS-12, the worry group (M = 2.88, SD = 1.15) scored higher than the control group (M = 2.47, SD = .76) but this difference was not significant, $t(55) = 1.46$, p = .15, d = 0.39.

3.4 Negative consequences of worry

A composite NCOW score was created by combining the means of the three VAS NCOW questions. The composite NCOW score was significantly correlated with the NCOW subscale of the COWS, $r_s(57) = .72$, $p < .001$, suggesting that the VAS measure possessed convergent validity with the full measure. The worry group (M = 66.92, SD = 22.23) scored significantly higher on the composite NCOW measure than the control group (M = 52.64, SD

= 22.15), $t(55) = 2.43$, $p < .05$, $d = 0.66$. On the NCOW subscale of the COWS, the worry group ($M = 2.91$, SD = 1.09) scored higher than the control group ($M = 2.57$, SD = .96) but this difference was not significant, $U(55) = 329$, $p = .22$, $d = 0.35$.

3.5 Positive consequences of worry

A composite PCOW score was created by combining the means of the two VAS PCOW questions. The composite PCOW score was significantly correlated with the PCOW subscale of the COWS, $r(57) = .57$, $p < .001$, suggesting that the VAS measure possessed convergent validity with the full measure. The worry group ($M = 53.79$, SD = 26.67) scored significantly higher on the composite PCOW measure than the control group ($M = 40.45$, SD = 20.07), $t(55) = 2.13$, $p < .05$, $d = 0.57$. On the PCOW subscale of the COWS, the worry group ($M = 2.52$, SD = 1.14) scored higher than the control group ($M = 2.22$, SD = .92) but this difference was not significant, $t(55) = 1.07$, $p = .29$, $d = 0.29$.

3.6 Correlations between dependent variables

The correlation between the VAS composite measures of the three dependent variables (IU, NCOW and PCOW) was examined. IU was significantly positively correlated with NCOW, $r_s(57) = .60$, $p < .001$, and PCOW, $r(57) = .39$, $p < .01$. NCOW and PCOW were positively correlated but this correlation was not significant, $r_s(57) = .13$, $p = .34$.

4. Discussion

The experiment described in this paper indicates that engaging in worry increases scores on worry relevant construct measures, specifically IU, NCOW and PCOW. These constructs have been hypothesised to be central in both driving and maintaining worry (Koerner & Dugas, 2006; Wells, 1999) and the results of the present study add to this

literature by indicating that such beliefs and thought patterns are processes that also emerge directly from engaging in worry.

Previous research has suggested that IU has a direct causal effect on worry (Meeten et al., 2012) which, when considered alongside the results of the current study, suggests a bidirectional relationship between IU and worry, consistent with the relationship pattern indicated by Dugas et al's. (2012) longitudinal study. Ruggiero et al. (2012) found that the effect of IU on worry was mediated by NCOW. If this is the case it would suggest that manipulating IU should lead to an increase in scores on NCOW. Future research may wish to examine this potential pathway.

The finding that worry has a causal influence on both NCOW and PCOW is consistent with the suggestion that frequent engagement in worry effects beliefs about worry (Cartwright-Hatton & Wells, 1997). Whilst the findings of the present study, when considered in conjunction with the metacognitive model (Wells, 1999), suggest a bidirectional relationship between worry and NCOW and PCOW respectively, to the authors' knowledge there is no published experimental evidence showing a direct causal effect of NCOW or PCOW on worry. Indeed, Prados (2011) manipulated both NCOW and PCOW and found that neither affected subsequent worry. Future research may wish to further explore if the relationship between worry and NCOW and PCOW, respectively, is unidirectional, where increasing worry increases subsequent positive and negative beliefs about worry, or if the relationship is bidirectional as would be suggested by the metacognitive model (Cartwright-Hatton & Wells, 1997).

Interestingly a causal effect of worry on negative mood was not found, which contradicts past research in this area (e.g., McLaughlin et al., 2007). The authors would

speculate that this finding may be due to the fact the worry task employed in the current study was one which required participants to worry about a hypothetical situation and not a situation related to the participant's own experience or life situation. It may be the case that in order for engaging in worry to increase negative mood, the worry topic must be a topic personal to one's own experience or life situation. Given that negative mood did not appear to mediate the relationship between worry and the constructs focused on in the current study, future research may wish to explore what other mediators may underlie these relationships. One possible mediator is a systematic information processing style, which has previously been shown to mediate the causal effect of negative mood on worry (Dash & Davey, 2012). Systematic information processing style has been described as an "analytic orientation in which perceivers access and scrutinise all informational input for its relevance and importance, and integrate all useful information in forming their judgements" (Chaiken, Liberman, & Eagly, 1989, p. 212). In reference to the current study, one can imagine how the process of being asked to generate a large number of worries about a hypothetical situation could have led to participants in the worry group adopting a systematic information processing style.

More broadly, the findings of the current study are in line with a recent body of research showing bidirectionality between anxiety related symptoms and their associated emotions, beliefs and thought patterns (e.g., Davey et al., 2013; Britton & Davey, 2014). The findings of the current study are also consistent with a motivational symptoms approach to understanding anxiety related symptoms (Britton & Davey, 2014). This approach considers clinically relevant symptoms such as worry as part of an evolved integrated threat management system that alerts the individual to threats to goals or challenges, and

coordinates cognitive, behavioral, and affective reactions to enable the individual to respond more effectively to these threats and challenges. Rather than one set of factors (e.g., constructs) being causes of a different set of factors (e.g., symptoms), they are all integrated components of an anxiety precautionary system that promotes a "cascade" of relevant perceptions, cognitions, behaviours, and affective experience conducive to solving the adaptive problem (Kenrick, Griskevicius, Neuberg, & Schaller, 2010).

When considering the implications of the present findings for clinical practice, the effect of worry on worry-related beliefs and thought patterns implies that addressing these beliefs and thought patterns in clinical treatments may not be a necessary condition for recovery. If such beliefs and thought patterns are triggered by the process of worry itself, then direct targeting of worry may be sufficient to reduce anxiety symptoms. Whilst interventions for GAD based around targeting IU (e.g., Dugas & Ladouceur, 2000) and metacognitive beliefs (e.g., Wells & King, 2006), respectively, have been shown to be effective treatments, this maybe due to more generalised elements of the treatments rather than because the treatments specifically target the relevant construct or constructs. This may especially be the case with interventions which target metacognitive beliefs, given there is no causal evidence of an effect of NCOW or PCOW on worry, with Prados (2011) failing to find that manipulating either construct effected subsequent worry levels. The metacognitive model implicates other elements in the causes of worry which are addressed in therapy, such as reassurance seeking and thought suppression (Wells & King, 2006).

There are a number of limitations associated with the current study worth commenting upon. Firstly, as outlined earlier in the discussion, a possible mediating variable in the effect of worry on clinical constructs is systematic processing (Dash & Davey, 2012).

As the current study can be seen as exploratory in terms of examining the effects of worry on clinical constructs, a group who were asked to produce a relatively large number of worries about a hypothetical situation (worry group) were compared to a group who were asked to produce a comparatively small number of worries about the same hypothetical situation (control group). A consequence of this is that the worry group are likely to have been more cognitively engaged in the manipulation task than the control group. It may be the case that this difference in cognitive engagement between the worry group and control group may have directly elicited a systematic processing style in the worry group compared to the control group, and that it is this engagement in systematic processing (as opposed to actually worrying) which led to increases in scores on the relevant constructs in the worry group compared to the control group. This possibility is supported by the fact that worrying and systematic information processing share similar functional brain characteristics in the left frontal lobes (Leynes, 2002; Leynes & Phillips, 2008) and systematic processing and worry are influenced by similar psychological cognitive states and appraisals (Dash, Meeten, & Davey, 2013). Future research may wish to examine if having participants engage in worry, as opposed to another neutral, equally cognitively engaging task, increases scores on the relevant constructs. This would increase confidence that it is actual engagement in worry, rather than engaging in systematic processing more generally, which increases scores on the relevant variables. Having participants in a control group engage in a neutral task (e.g., the naming of incidents from some category, such as animals) rather than engaging in worrying would also provide a starker contrast between the worry and control groups in terms of the respective tasks they are asked to perform. Another possible confounding factor which may have affected the results of the current study is that as participants in the control group were asked to produce only two worries whilst participants in the worry

group were asked to produce twenty, it is likely that those in worry group would have spent significantly longer engaging in the manipulation than those in the control group. It maybe that differences between the groups on the subsequent measures of the clinical constructs may have been an artefact of this difference in terms of time engaged in the manipulation. This possibility would also be addressed by having a control group engage in a neutral, equally cognitively engaging task.

Secondly, whilst pre-manipulation worry levels were measured showing that the worry group and control group did not differ significantly in terms of pre-manipulation worry levels, worry was not measured post-manipulation. It is therefore not possible to compare worry levels between the two groups post-manipulation. Future studies which aim to experimentally manipulate worry should consider measuring worry levels post-manipulation so that possible group differences can be explored.

Thirdly, a potential limitation of the current study is that participant's responses may have been affected by demand characteristics. Specifically, as the manipulation involved a worry task, this may have effected responses on the subsequent measures of IU, PCOW and NCOW. This is especially the case for the PCOW and NCOW measures, which explicitly refer to worrying. Whilst it would be difficult to manipulate worry experimentally without introducing the potential for demand characteristics, employing a filler task between the manipulation and the subsequent measurement of the clinical constructs may have reduced this potential.

Fourthly, given that the worry manipulation in the current study involved a situation which was hypothetical in nature, it could be argued that the worry manipulation lacks ecological validity. Whilst some studies have manipulated worry by having participants select their own topic of worry (e.g., Borkovec & Inz, 1990) the authors felt, given the

potentially diverse nature of topics that participants might chose to worry about and the possible variation in subsequent intensity of worry as a result of such diversity, that it would be difficult to control how much participants would actually engage in the process of worrying using such a method. Further, a series of studies by Davey and Levy (1998) showed that individuals tend to worry about hypothetical worries they have never encountered before. This was demonstrated across a range of participants ranging from non-worriers to chronic high worriers with PSWQ scores indicative of a diagnosis of GAD, supporting the use of hypothetical worry scenarios in experimental studies examining worry related phenomena. Nevertheless, future research may wish to examine if the effect of worry on the constructs measured in the current study would be replicated with a worry manipulation which asks participants to worry about a topic of their own choosing. As mentioned above, it may be the case that in order for worry to affect negative mood, the content of the worry topic needs to be personal, rather than hypothetical, in nature.

Fifthly, although participants were asked to ensure they completed the study in one sitting in a location/at a time where they would not be disturbed, given that the study was delivered online, we cannot be sure that all participants complied with this request. Future research may wish to replicate the current study in a controlled, laboratory environment.

Sixthly, the current study utilised a non-clinical sample. As mentioned in the introduction, approximately two thirds of the population report one or more worries (Goncalves & Byrne, 2013) and taxometric studies suggest that normal and pathological worry are best conceptualised as occupying two points on a single continuum (e.g., Ruscio et al., 2001) supporting the use of non-clinical samples in investigating worry related phenomena. Moreover, many studies have made use of non-clinical samples when investigating the potential causes of worry (e.g., Meeten et al., 2012; Ladouceur, Gosselin, &

Dugas, 2000). Nevertheless, the results of the current study would be strengthened if they were replicated in a clinical sample.

Seventh, Cohen (1992) suggests that in order to detect a medium difference (d = .50) between two independent sample means at an unadjusted significance level of $p < .05$ a sample size of n = 128 is required. The current study (n = 57) is therefore underpowered for detecting a medium difference at an unadjusted significance level of $p < .05$. Low power also reduces the likelihood that a statistically significant result reflects a true effect. Consequences of this include overestimates of effect size and low reproducibility of results (Button et al., 2013).

Finally, it should be noted that the current study examined the effect of a brief manipulation, which targeted state worry, on the relevant measured constructs. The study therefore does not directly inform us about the possible effects of chronic worry on the relevant measured constructs. Relatedly, a fairly recent distinction has been made between state and trait IU (Shihata, McEvoy, Mullan, & Carleton, 2016). It should be noted that the effect of the manipulation in the current study on IU is likely to have been on state IU as opposed to trait IU. The extent to which state IU and trait IU co-occur is not known and future research is needed to determine if state expressions of IU and trait expressions of IU differ in their relationships with psychopathology (Shihata et al., 2016).

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6. Informed consent

Informed consent was obtained from all individual participants included in the study.

7. Ethical Approval

Ethical approval for the current study was obtained from University of Derby. All procedures were performed in accordance with the ethical standards of the British Psychological Society and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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